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Ciba Specialty Chemicals Corporation
North America

Corporate
Remediation Services

Ciba

September 19, 2002

Mr. Frank Battaglia
USEPA Region III
Office of Site Remediation and Restoration (HBT)
JFK Federal Building
Boston, MA 02203

RE: Cranston, RI
Sediment Sampling Plan for the Pawtuxet River

Dear Mr. Battaglia:

The enclosed document presents a sediment sampling and analysis plan for the Pawtuxet River, Cranston, RI. USEPA and RIDEM require sediment sampling as part of a follow-up study on remediation work completed at the former Ciba facility in 1996. We look forward to meeting with you to discuss this matter on October 10, 2002.

If you have any questions regarding this plan, please contact me at (732) 914-2594.

Very truly yours,

Ciba Specialty Chemicals Corporation

Robert Youhas
Environmental Associate
Ciba Specialty Chemicals Corporation

Attachment (1)

Oak Ridge Parkway
P.O. Box 71
Toms River, NJ 08754-0071
Tel. 732 914 2500

Value beyond chemistry

cc:	K. Dupuis	Ciba
	D. Williams	Ciba
	R. McNabb	Ciba
	B. Cohen	Ciba
	D. Ellis	Ciba
	M. Bradley	RIDEM
	F. Battaglia (3)	Region III EPA
	Ciba File	

SEDIMENT SAMPLING PLAN FOR THE PAWTUXET RIVER

FORMER CIBA-GEIGY FACILITY CRANSTON, RHODE ISLAND

SUBMITTED BY

Ciba

SUBMITTED TO

State of Rhode Island
Department of Environmental Management

EPA
United States Environmental Protection Agency

PREPARED BY

Ciba Specialty Chemicals
Corporate Remediation
Toms River, New Jersey
SEPTEMBER 2002

Sediment Sampling and Analysis Plan for the Pawtuxet River
Cranston, Rhode Island

Ciba Specialty Chemicals Corp.

September 2002

1.0 OVERVIEW

This document presents a sediment sampling and analysis plan for the Pawtuxet River, Cranston, RI. USEPA and RIDEM require sediment sampling as part of a follow-up study on remediation work completed at the former Ciba facility in 1996 (CMS 1996). Sediment sampling and analysis of river sediments is proposed as a means of evaluating projected improvements in the four reaches of the Pawtuxet River adjacent to the former Ciba facility (see Figs. 2-1, 2-2, and 2-3).

1.1 Site History

The Alrose Chemical Company manufactured chemicals at the Site beginning in 1930. The Geigy Chemical Company purchased the Site in 1954 and merged with Ciba Corporation in 1970. The facility operated until May 1986. Throughout its operational history, the Site was used for the manufacturing of various agricultural products, leather and textile auxiliaries, plastics additives, optical brighteners, pharmaceuticals, and bacteriostats.

An Administrative Order of Consent in which Ciba agreed to conduct an RCRA Corrective Action Study at the Site was issued to Ciba. The Order became effective in June 1989. There are four stages to an RCRA Corrective Action Study: an RCRA Facility Asssessment (RFA), an RCRA Facility Investigation (RFI), a Corrective Measures Study (CMS) Proposal and a Corrective Measures Study Report. The RFA, conducted by USEPA prior to the Order, determined that known and/or suspected releases of hazardous materials had occurred at the Site. The RFI was then conducted in 1996 to characterize the impact of known or suspected releases that were determined by the RFA to require further investigation. The Pawtuxet River RFI consisted of five tasks: the physical characterization, source characterization, release characterization, river modeling (hydrodynamic, sediment transport, and fate and transport of contaminants), and an ecological risk assessment. The CMS Report for the Pawtuxet River was submitted in 1996. The CMS Report identified, described, and evaluated the corrective measures necessary to achieve the Media Protection Standards (MPS) proposed for the media of concern.

As part of the overall IRM program that Ciba is implementing at this Site, a voluntary sediment IRM (Interim Remedial Measure) was conducted during the period October 12, 1995 through January 10, 1996. The sediment IRM was conducted according to the procedures presented in the Conceptual Design Work Plan, Cranston Site, Cofferdam Interim Remedial Measure (Work Plan) that was submitted to USEPA, RIDEM, and the USACOE in May 1995. Over 2,225 tons of contaminated sediment were excavated from the Pawtuxet River and replaced with clean sand during the Sediment IRM. The excavated area contained a sampling location (SD-03R) where high concentrations of PCBs were measured, as well as the only location in the Upper or Lower Facility reaches where 4-Chloroaniline was measured. When completed, the Sediment IRM achieved its primary objective of excavating and disposing of visually contaminated river sediment from the Former Cofferdam Area.

Post-excavation sampling of sediment is required by EPA/RIDEM. This sampling plan will fulfill that requirement.

1.2 Pawtuxet River Characteristics

The Pawtuxet River is a fourth order stream that drains about 230 square miles of mixed industrial and urban land. Flow in the river is regulated by reservoirs upstream. The river is classified by RIDEM (2000) as Class B1. Class B1 waters are designated for fish and wildlife habitat and primary and secondary contact recreational activities. The average daily flow in the river is about 350 cubic feet per second. Highest flows occur in April; lowest flows occur in August. In the 4.5 mile section of the river from the Cranston gauge to Pawtuxet Cove Dam, the river varies from about 60 to 200 feet wide, with mid-channel depths of 3 to 14 feet. Sediment thickness ranges from 0 to 4 feet thick, based on manual probing of sediment. Depositional zones, or areas where sediments are thicker, tend to occur on the inside bends of the river and just downstream of large pools. Sediment within these depositional zones is typically characterized by high total organic carbon, higher percentage of fine-grained material, and higher cation exchange capacity.

2.0 SEDIMENT SAMPLING OBJECTIVES

- Obtain sediment samples at the specified depths and locations proposed in Section 2.1.

- Analyze sediment samples for the *Proposed Sampling Analytes* in Table 2-4.

    - Inorganics, VOCs, and PAHs are the target analytes selected for study in this sampling plan - based on concentrations measured before the sediment IRM was implemented.

- Evaluate the current status of sediment contaminant concentrations upstream, downstream, and within the former Ciba facility reaches of the Pawtuxet River and compare these findings with the 1996 RFI Report data.

- Make recommendations.

2.1 Sediment Sampling Locations

Sediment samples will be taken within each of the four reaches of the former Ciba-Geigy facility: upstream, upper facility, lower facility, and downstream. The proposed sediment sampling locations are shown in Figures 2-1, 2-2, and 2-3. Sediment sampling locations have been selected on the basis of concentrations measured during the Release Characterization and from recommendations made in the 1996 CMS (Table 2-1). The sampling locations will essentially be the same locations that were recommended in the CMS, but with some modifications:

- Ciba proposes to sample at three locations in the upstream reach: SD-TU7A, SD-00M, and SD-01R, instead of the five recommended in the CMS. Data exists on contaminant concentrations in the upstream reach of the Pawtuxet River from baseline sampling completed during the RFI. In addition, the five sampling locations recommended in the CMS are relatively uniform in terms of contaminant type and contaminant concentration (RFI Report, 1996). Ciba contends that the placement of the three proposed upstream sampling locations will provide a sufficient amount of data for comparison to RFI values.

- As a point of clarification, sampling location SD-03R is within the remediated Former Cofferdam Area. A sampling location identified only as "In the IRM fill" was proposed in the CMS. Station SD-03R is within this IRM fill, and will be used as a sampling location in this program.

- Ciba proposes to eliminate sampling location SD-09AL from the CMS list of recommended sampling locations. SD-09AL is within 120 feet of another sampling location, SD-10M, in the downstream reach of the Pawtuxet River. As both sampling locations are very close to one another, they possess very similar contaminant data (RFI Report, 1996). Ciba believes that data gathered from SD-10M will be representative of SD-09AL.

2.2 Sediment Sampling Methods

All samples will be collected using the gravity push core method used during the RFI. The apparatus that will be used will be similar to that illustrated in Fig. 2-4. The coring device consists of two basic parts – a core barrel with a cutting head, and a core liner with core catcher. Starting at the downstream locations first (to avoid cross-contamination of disturbed sediments migrating downstream from the sampling points), the corer will be dropped to the sediment-water interface and then pushed by hand to 14" (to allow for an accurate 12" core) or the maximum possible penetration. Once the desired penetration depth is achieved, the corer will be retrieved into the boat and the core liner/catcher with intact core will be removed. Cores will then be transferred to glass containers with appropriate labeling for delivery to the laboratory. Table 2-2 presents the minimum sample sizes and acceptable containers for physical/chemical analyses of sediments.

Sediment from all sixteen sampling locations will be sampled using surface (0-6 in.) and depth intervals (6-12 in.) from individual cores. In the laboratory, the following sections from the surface interval will be sampled: 0-1", 1-2", 3-4", and 5-6". The depth interval (6-12") will be sampled as one complete section. These chosen sampling depths provide a sufficient sediment profile that takes into account sediment deposition/resuspension over time. Three replicates will be taken per station, but only one core per station will be analyzed immediately. The other two replicates will be preserved (frozen) for additional analysis as needed.

2.2.1 Field Documentation

To ensure proper record keeping, the following list of standardized forms will be used in this investigation:

- *Field log*—General information such as the names of the field crew, arrival and departure dates and times, weather, and other miscellaneous observations will be recorded in a field log.

- *Station/sample log*—Each gear deployment event should be recorded on a station log sheet. One or more station/sample log sheets may be completed for each station where sediment sampling is conducted. The station name, date, gear and cast number, depth, and location coordinates will be recorded on each log sheet. Penetration depth, sediment type, sediment color, sediment odor, presence of any organisms, and obvious evidence of contamination (e.g., sheen, wood waste, oil droplets, sandblast grit, paint chips) will also be recorded, as well as the sample type, sample identifier, and unique sample number. If any materials such as woody debris, shells, or rocks are removed prior to homogenizing the sample, the type of material and approximate quantity will be noted. Any deviations from the sampling and analysis plan that were necessitated by field conditions will also be noted on the station/sample log sheet.

- *Sample analysis request form*—Each set of samples sent to a laboratory will be accompanied by a sample analysis request form that identifies the samples by their unique identifying number. This form should identify any preservative or other sample pretreatment applied and the analyses to be conducted by referencing a list of specific analytes or the statement of work for the laboratory. One copy of this form will be retained by the chief scientist, and one copy will accompany the shipment of samples to the laboratory.

- *Chain-of-custody form*— Provisions will be included in all sediment sampling and analysis plans for documenting the chain-of-custody between sample collection and arrival at the analytical laboratory. Each sample container will be recorded on a chain-of-custody form at the end of each day's sampling. The chain-of-custody form will be completed in duplicate or triplicate and will identify the sample collection date and time, the project, and the chief scientist. It is the chief scientist's responsibility to ensure that these forms are accurately completed and signed at the time of sample transfer. One copy of the form will be placed in a waterproof bag and attached to the inside of each sample cooler. The chief scientist will keep one copy of the form. In the event that sediment subsamples are being sent to different laboratories (e.g., chemistry laboratory, toxicology laboratory), separate chain-of-custody forms will be prepared for each laboratory and each sample cooler. The sample cooler will be sealed with chain-of-custody tape and kept in a secure location when not in the presence of the chief scientist or assigned crew.

2.2.2 Sample Storage Requirements for Chemical/Physical Analyses

All sediment samples intended for chemical/physical analyses will be transported to the analytical laboratory on ice at 4°C. Upon receipt at the laboratory, storage temperatures and maximum holding times will be determined based on the analyses to be performed. In some cases, the requirements may vary, depending on how long it will be before the laboratory expects to analyze the samples. Required storage temperatures and maximum holding times are presented in Table 2-3. Sediment samples may be archived for later analysis by freezing them and holding them at -18°C; allowance for expansion of the sample should be made to prevent breakage of the sample bottles upon freezing. The archived samples may be thawed within the maximum holding times listed in Table 2-3 and analyzed for any of the analytes, except for ammonia, total sulfides, volatile organic compounds, and grain size.

2.3 Sediment Sampling Analyses

This sampling campaign will provide information on how concentrations of target contaminants have changed since the last sampling round was completed in the early 1990s. The chemicals proposed for monitoring include compounds for which MPS are being developed and those identified in the Aquatic Baseline Ecological Risk Assessement (Ciba, 1996) and Corrective Measures Study (Ciba, 1996). The proposed list of chemicals recommended for monitoring is summarized by chemical class in Table 2-4 The 1996 RCRA RFI sediment data for each proposed sampling location is presented in Tables 2-5, 2-6, 2-7, and 2-8. These RFI values will later be compared with the findings of this sampling campaign.

3.0 HEALTH AND SAFETY

The site-specific Health and Safety Plan for this sediment sampling plan can be found in Appendix B. In addition, boating safety guidelines can be found in Appendix C.

4.0 REFERENCES

Ciba-Geigy Corporation. 1996. RCRA Facility Investigation Report for the Pawtuxet River, Volume 1. March.

Ciba-Geigy Corporation. 1996. RCRA Facility Investigaiton Report, Volume 3, Aquatic Baseline Ecological Risk Assessment for the Ciba-Geigy Site at Cranston, Rhode Island. March.

State of Rhode Island and Providence Plantations Department of Environmental Management and Water Resources. 2000. Water Quality Regulations. June.

Washington Department of Ecology: Sediment Management. 2001. http://www.ecy.wa.gov/programs/tcp/smu/sapa/sapa.htm.

Woodward-Clyde Consultants. 1996. Pawtuxet River Corrective Measures Study. August.

APPENDIX A

FIGURES & TABLES

Table 2-1 Proposed Sampling Locations*

Upstream	Upper Facility	Lower Facility	Downstream
SD-01R	SD-02L	SD-04R	SD-10M
SD-TU7A	SD-02R	SD-05L	SD-13R
SD-00M	SD-03L	SD-06R	SD-16M
	SD-03R	SD-07L	SD-20M
		SD-08M	

*Woodward-Clyde Consultants. 1996. Pawtuxet River Corrective Measures Study.

Table 2-2. Minimum Sediment Sample Sizes and Acceptable Containers for Physical/Chemical Analyses*

Sample Type	Minimum Sample Size[a]	Container Type[b]
Physical/Chemical Analyses		
Grain size	100–150 g	P,G
Total solids	50 g	P,G
Total volatile solids	50 g	P,G[c]
Total organic carbon	25 g	P,G
Ammonia	25 g	P,G
Total sulfides	50 g	P,G[c]
Oil and grease	100 g	G
Metals (except mercury)	50 g	P,G
Mercury	1 g	P,G
Volatile organic compounds	50 g	G,T[c]
Semivolatile organic compounds	50–100 g	G
Pesticides and PCBs	50–100 g	G,T

[a] Recommended field sample sizes (wet weight basis) for one laboratory analysis. If additional laboratory analyses are required (e.g., laboratory replicates, allowance for having to repeat an analysis), the field sample size should be increased accordingly. For some chemical analyses, smaller sample sizes may be used if comparable sensitivity can be obtained by adjusting instrumentation, extract volume, or other factors of the analysis.

[b] P - linear polyethylene; G - borosilicate glass; T - polytetrafluorethylene (PTFE, Teflon®)-lined cap.

[c] No headspace or air pockets should remain. If such samples are frozen in glass containers, breakage of the container is likely to occur.

*Washington Department of Ecology: Sediment Management. 2001.
http://www.ecy.wa.gov/programs/tcp/smu/sapa/sapa.htm

Table 2-3. Storage Temperatures and Maximum Holding Times for Physical/Chemical Analyses*

Sample Type	Storage Temperature	Maximum Holding Time
Grain Size	Cool, 4°C	6 months
Total solids	Cool, 4°C Freeze, -18°C	14 days 6 months
Total volatile solids	Cool, 4°C Freeze, -18°C	14 days 6 months
Total organic carbon	Cool, 4°C Freeze, -18°C	14 days 6 months
Ammonia	Cool, 4°C	7 days
Total sulfides	Cool, 4°C (1 N zinc acetate)	7 days
Oil and grease	Cool, 4°C (HCl) Freeze, -18°C (HCl)	28 days 6 months
Metals (except mercury)	Cool, 4°C Freeze, -18°C	6 months 2 years
Mercury	Freeze, -18°C	28 days
Semivolatile organic compounds; pesticides and PCBs; PCDDs/PCDFs	Cool, 4°C Freeze, -18°C	10 days 1 year
after extraction	Cool, 4°C	40 days
Volatile organic compounds	Cool, 4°C Freeze, -18°C	14 days 14 days

Note: HCl - hydrochloric acid
PCB - polychlorinated biphenyl
PCDD - polychlorinated dibenzo-p-dioxin
PCDF - polychlorinated dibenzofuran

http://www.ecy.wa.gov/programs/tcp/smu/sapa/sapa.htm

Table 2-4 Proposed Sampling Analytes*

INORGANICS	***VOCs***
CADMIUM	CHLOROBENZENE
COPPER	M&P-XYLENE
CYANIDE	O-XYLENE
LEAD	TOLUENE
THALLIUM	
ZINC	***OTHER SEMI-VOC***
	1,2-DICHLOROBENZENE
PAHs	4-CHLOROANILINE
2-METHYLNAPHTHALENE	TINUVIN 328
ANTHRACENE	
BENZO(A)ANTHRACENE	***OTHER***
BENZO(A)PYRENE	GRAIN SIZE
BENZO(B)FLUORANTHENE	TOTAL ORGANIC CARBON
BENZO(G,H,I)PERYLENE	
BENZO(K)FLUORANTHENE	
CHRYSENE	
DIBENZ(A,H)ANTHRACENE	
FLUORANTHENE	
INDENO(1,2,3-CD)PYRENE	
PYRENE	

*Woodward-Clyde Consultants. 1996. Pawtuxet River Corrective Measures Study.

Table 2-5 1996 RCRA Facility Investigation Sediment Data for the Pawtuxet River*

UPSTREAM LOCATIONS

CONSTITUENTS	SD-01R	SD-TU7A	SD-00M
Volatile Organics			
CHLOROBENZENE	0.065 U	0.00385 U	0.06 U
M&P-XYLENE	0.065 U	0.00385 U	0.06 U
O-XYLENE	0.065 U	0.00385 U	0.06 U
TOLUENE	0.065 U	0.00385 U	0.06 U
Semi-Volatile Organics			
1,2-DICHLOROBENZENE	0.6 U	0.255 U	0.6 U
4-CHLOROANILINE	0.6 U	0.33 J	0.6 U
Inorganics			
CADMIUM	0.235 U	1.2	0.25 U
COPPER	27.3 J	50.5 J	9.0 J
CYANIDE	0.175 U	R	0.29 U
LEAD	11 J	50.5	19.7
THALLIUM	0.325	0.75 U	0.235 U
ZINC	28 J	63.1	35.2 J
PAHs			
2-METHYLNAPHTHALENE	0.6 U	0.255 U	0.6 U
ANTHRACENE	0.14 J	0.05 J	0.11 J
BENZO(A)ANTHRACENE	0.51 J	0.2 J	0.28 J
BENZO(A)PYRENE	0.43 J	0.22 J	0.6 U
BENZO(B)FLUORANTHENE	0.74 J	0.36	0.41 J
BENZO(G,H,I)PERYLENE	0.39 J	0.15 J	0.6 U
BENZO(K)FLUORANTHENE	0.83 J	0.14 J	0.42 J
CHRYSENE	0.61 J	0.27 J	0.34 J
DIBENZ(A,H)ANTHRACENE	0.19 J	0.155 U	0.6 U
FLUORANTHENE	1.7	0.58	0.64 J
INDENO(1,2,3-CD)PYRENE	0.32 J	0.15 J	0.6 U
PYRENE	0.61 J	0.56	0.76 J

All results are in mg/kg (ppm) J = estimated R = rejected NA = not analyzed
U = non-detected (non-detected results are listed at one half the reported detection limit)

Depth range for all samples was 0-6"

*Data from Ciba-Geigy Corporation. 1996. RCRA Facility Investigation Report for the Pawtuxet River, Volume 1. March.

Table 2-6 1996 RCRA Facility Investigation Sediment Data for the Pawtuxet River*

UPPER FACILITY LOCATIONS

CONSTITUENTS	SD-02L	SD-02R	SD-03L	SD-03R
Volatile Organics				
CHLOROBENZENE	0.063 J	26	0.078 J	360 J
M&P-XYLENE	0.155 U	1 J	0.15 U	8.2 J
O-XYLENE	0.155 U	0.23 J	0.15 U	7 U
TOLUENE	0.076 J	0.87 J	0.1 J	470 J
Semi-Volatile Organics				
1,2-DICHLOROBENZENE	0.22 J	4.6	1.45 U	R
4-CHLOROANILINE	1.3 U	1.5 U	1.45 U	32 J
Inorganics				
CADMIUM	5.3 J	22 J	6.5 J	11 J
COPPER	516 J	947 J	98.6 J	306 J
CYANIDE	25.6	13.2	2.8	3
LEAD	375 J	594 J	100 J	223 J
THALLIUM	1.16	0.974	0.936	0.802
ZINC	1070 J	1460 J	221 J	13900 J
PAHs				
2-METHYLNAPHTHALENE	0.44 J	2.1 J	1.45 U	R
ANTHRACENE	0.53 J	0.93 J	0.29 J	R
BENZO(A)ANTHRACENE	3.6	3.2	1.6 J	R
BENZO(A)PYRENE	3.5	3.6	1.4 J	R
BENZO(B)FLUORANTHENE	6.9	6.5	2.8 J	R
BENZO(G,H,I)PERYLENE	3.2	3.3	1.7 J	R
BENZO(K)FLUORANTHENE	7.7	7.3	3.1	R
CHRYSENE	6.1	5.2	2.2 J	R
DIBENZ(A,H)ANTHRACENE	1.3 J	1.5 J	0.62 J	R
FLUORANTHENE	14	11	5.3	R
INDENO(1,2,3-CD)PYRENE	2.9	3	1.4 J	R
PYRENE	5.3	3.9	1.9 J	R

All results are in mg/kg (ppm) J = estimated R = rejected NA = not analyzed

Depth range for all samples was 0-6"

U = non-detected (non-detected results are listed at one half the reported detection limit)
*Data from Ciba-Geigy Corporation. 1996. RCRA Facility Investigation Report for the Pawtuxet River, Volume 1. March.

Table 2-7 1996 RCRA Facility Investigation Sediment Data for the Pawtuxet River*

LOWER FACILITY LOCATIONS

CONSTITUENTS	SD-04R	SD-05L	SD-06R	SD-07L	SD-08M
Volatile Organics					
CHLOROBENZENE	0.17	0.065 U	0.085 U	0.145 U	0.065 U
M&P-XYLENE	0.075 U	0.065 U	0.085 U	0.145 U	0.065 U
O-XYLENE	0.075 U	0.065 U	0.085 U	0.145 U	0.065 U
TOLUENE	0.58	0.035 J	R	0.145 U	0.065 U
Semi-Volatile Organics					
1,2-DICHLOROBENZENE	0.7 U	0.6 U	0.8 U	0.2 J	0.6 U
4-CHLOROANILINE	0.7 U	0.6 U	0.8 U	1.45 U	0.6 U
Inorganics					
CADMIUM	0.94 J	0.22 U	2	13.5 J	0.275 U
COPPER	81.5 J	15.2 J	21.3 J	226 J	6.4 U
CYANIDE	0.2 U	0.265 U	0.39 U	1.3	0.155 U
LEAD	79.3 J	24.7	28.4	200 J	16.5 J
THALLIUM	0.463	0.235 U	0.3 U	1.27	0.285 U
ZINC	225 J	47 J	63.1 J	370 J	43.7 J
PAHs					
2-METHYLNAPHTHALENE	0.7 U	0.6 U	0.8 U	1.45 U	0.6 U
ANTHRACENE	0.14 J	0.048 J	0.085 J	0.33 J	0.14 J
BENZO(A)ANTHRACENE	0.8 J	0.32 J	0.96 J	2.1 J	0.42 J
BENZO(A)PYRENE	0.85 J	0.6 U	0.79 J	2.2 J	0.35 J
BENZO(B)FLUORANTHENE	1.4	0.53 J	2.1	4.6	0.32 J
BENZO(G,H,I)PERYLENE	0.84 J	0.6 U	0.8 U	2.2 J	0.32 J
BENZO(K)FLUORANTHENE	1.6	0.55 J	2.2	5.1	0.36 J
CHRYSENE	1.1 J	0.37 J	1.1 J	3.4	0.44 J
DIBENZ(A,H)ANTHRACENE	0.14 J	0.6 U	0.8 U	0.34 J	0.6 U
FLUORANTHENE	3.1	0.6 J	1.6	8.2	1.2
INDENO(1,2,3-CD)PYRENE	0.7 J	0.6 U	1 J	2 J	0.28 J
PYRENE	1 J	0.67 J	1.7	2.6 J	0.43 J

All results are in mg/kg (ppm) J = estimated R = rejected NA = not analyzed
U = non-detected (non-detected results are listed at one half the reported detection limit)

Depth range for all samples was 0-6"

*Data from Ciba-Geigy Corporation. 1996. RCRA Facility Investigation Report for the Pawtuxet River, Volume 1. March.

Table 2-8 1996 RCRA Facility Investigation Sediment Data for the Pawtuxet River*

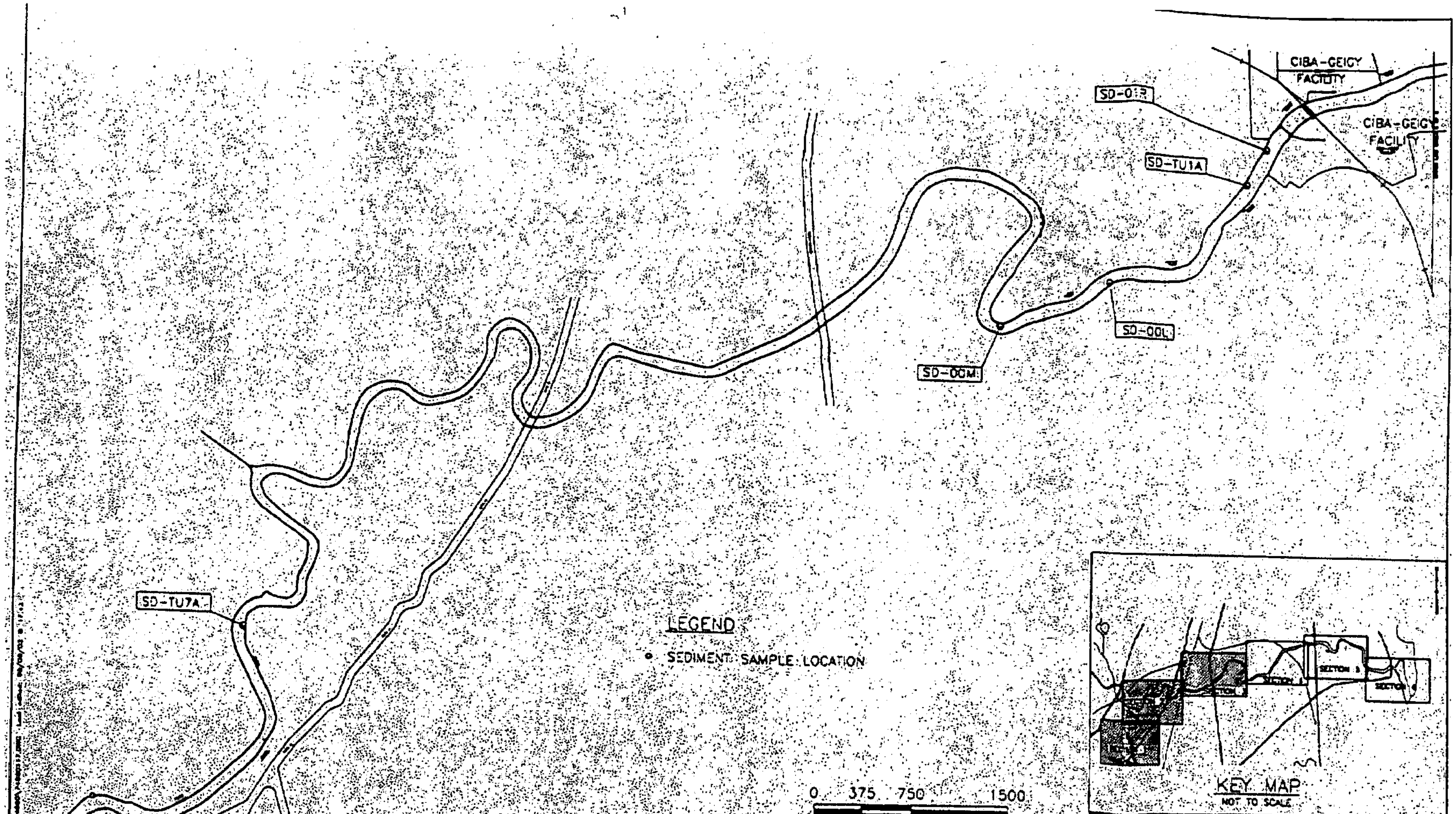
DOWNSTREAM LOCATIONS

CONSTITUENTS	SD-10M	SD-13R	SD-16M	SD-20M
Volatile Organics				
CHLOROBENZENE	0.07 U	0.072 J	0.065 U	0.06 U
M&P-XYLENE	0.07 U	0.09 U	0.065 U	0.06 U
O-XYLENE	0.07 U	0.09 U	0.065 U	0.06 U
TOLUENE	0.07 U	0.14 J	0.065 U	0.06 U
Semi-Volatile Organics				
1,2-DICHLOROBENZENE	0.65 U	0.85 U	0.6 U	R
4-CHLOROANILINE	0.65 U	0.85 U	0.6 U	R
Inorganics				
CADMIUM	1.6	6.5 J	0.255 U	0.25 U
COPPER	21.5 J	117 J	16.6 J	5.55 U
CYANIDE	0.305 U	0.195 U	0.155 U	0.135 U
LEAD	18.5	84.9 J	13.9 J	13.5 J
THALLIUM	0.27 U	0.578	0.442	0.21 U
ZINC	58.4 J	195 J	50.4 J	44.3 J
PAHs				
2-METHYLNAPHTHALENE	0.65 U	0.85 U	0.6 U	R
ANTHRACENE	0.16 J	0.2 J	0.054 J	R
BENZO(A)ANTHRACENE	0.67 J	1 J	0.35 J	R
BENZO(A)PYRENE	0.56 J	1 J	0.31 J	R
BENZO(B)FLUORANTHENE	1.1 J	1.8	0.46 J	R
BENZO(G,H,I)PERYLENE	0.65 U	0.95 J	0.25 J	R
BENZO(K)FLUORANTHENE	1.2 J	2.1	0.52 J	R
CHRYSENE	0.79 J	1.4 J	0.41 J	0.15 J
DIBENZ(A,H)ANTHRACENE	0.65 U	0.85 U	0.13 J	R
FLUORANTHENE	1.3	3.6	1 J	0.32 J
INDENO(1,2,3-CD)PYRENE	0.65 U	0.83 J	0.24 J	R
PYRENE	1.5	1.2 J	0.35 J	0.14 J

All results are in mg/kg (ppm) J = estimated R = rejected NA = not analyzed
U = non-detected (non-detected results are listed at one half the reported detection limit)

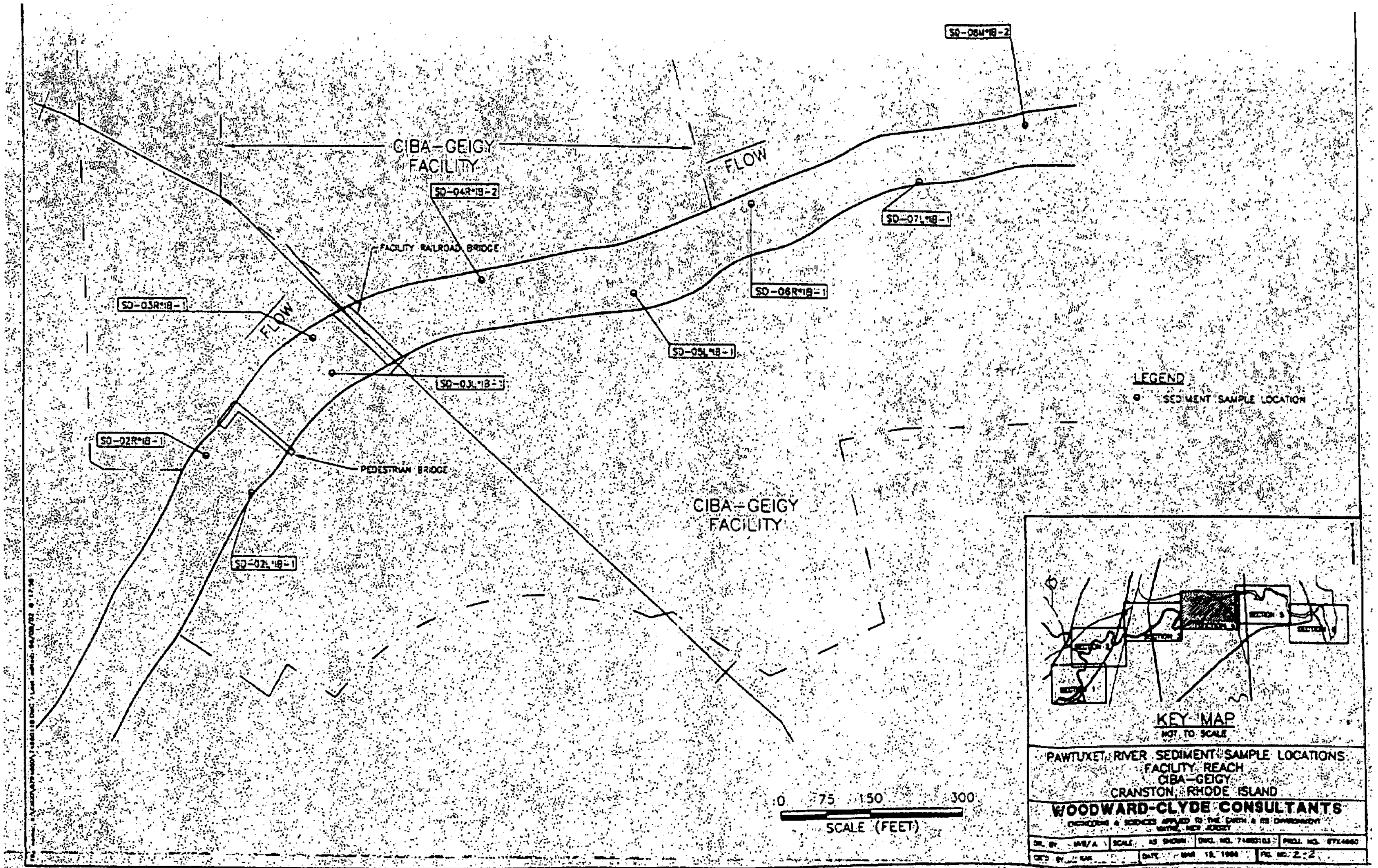
Depth range for all samples was 0-6"

*Data from Ciba-Geigy Corporation. 1996. RCRA Facility Investigation Report for the Pawtuxet River, Volume 1. March.

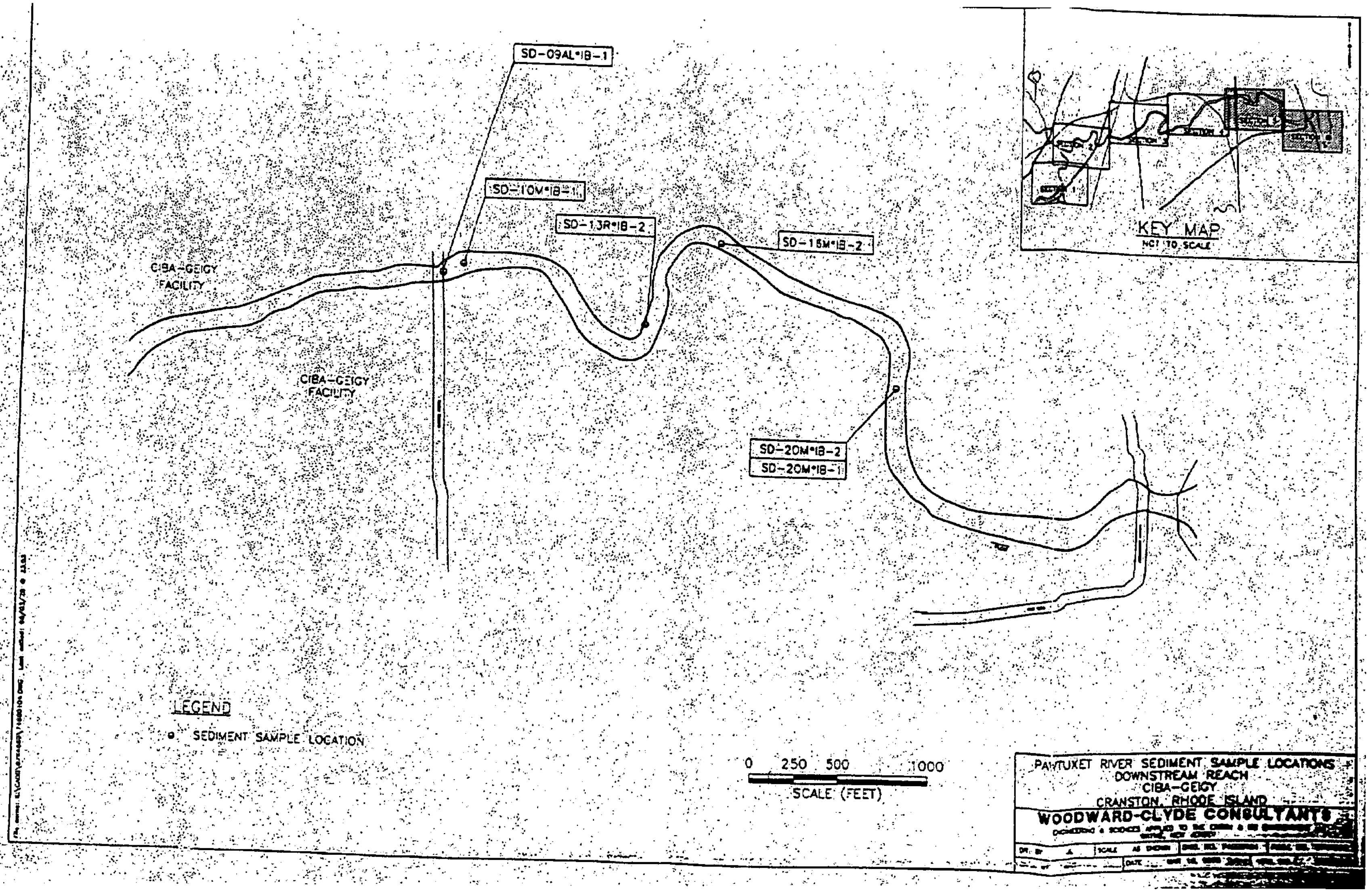


PAWTUXET RIVER SEDIMENT SAMPLE LOCATIONS
UPSTREAM REACH
CIBA-GEIGY
CRANSTON, RHODE ISLAND

WOODWARD-CLYDE CONSULTANTS



CIBA-GEIGY FACILITY
FLOW
SD-06M*18-2
SD-04R*18-2
SD-07L*18-1
FACILITY RAILROAD BRIDGE
SD-06R*18-1
SD-03R*18-1
FLOW
SD-05L*18-1
SD-03L*18-1
LEGEND
SEDIMENT SAMPLE LOCATION
SD-02R*18-1
PEDESTRIAN BRIDGE
CIBA-GEIGY FACILITY
SD-02L*18-1
KEY MAP
NOT TO SCALE
0 75 150 300
SCALE (FEET)
PAWTUXET RIVER SEDIMENT SAMPLE LOCATIONS
FACILITY REACH
CIBA-GEIGY
CRANSTON, RHODE ISLAND
WOODWARD-CLYDE CONSULTANTS
FIG. NO. 2-2


SD-09AL*IB-1
SD-10M*IB-1
SD-13R*IB-2
SD-16M*IB-2
SD-20M*IB-2
SD-20M*IB-1
CIBA-GEIGY FACILITY
CIBA-GEIGY FACILITY
KEY MAP
NOT TO SCALE
LEGEND
SEDIMENT SAMPLE LOCATION
0 250 500 1000
SCALE (FEET)
PAWTUXET RIVER SEDIMENT SAMPLE LOCATIONS
DOWNSTREAM REACH
CIBA-GEIGY
CRANSTON, RHODE ISLAND
WOODWARD-CLYDE CONSULTANTS
SCALE AS SHOWN
DATE

APPENDIX B

HEALTH AND SAFETY PLAN

(To be completed)

APPENDIX C

BOATING SAFETY GUIDELINES

BOATING SAFETY GUIDELINES

Registration

All boats must be registered and their numbers and validation stickers displayed. The certificate of registration must be on board at all times when the boat is being operated.

Equipment

All boats used on projects will be required to have the equipment provided below.

Class A (Less than 16 feet long)

Type I, II, III or IV (Personal Flotation Device (PFD) per person.

Class B-1 fire extinguisher (if required by boat design).

Whistle/Air Horn/Flare Gun

Bilge ventilation and engine flame arrester on inboard engines.
Lights: 1 white 32-pt stern light which must be higher than any part of the boat; 1 red and green 10-pt side light forward (20 pt combined).

Equipment for Safety

- Life-Saving Devices

  All boats will carry flotation devices for all persons on board. It is an absolute "rule of the boat" that all crewmembers wear a life preserver or buoyant vest at all times when the craft is underway. At the higher speeds of most outboards, there may not be time to locate and put on a life jacket when a sudden emergency occurs.

- Paddle or Oar

  Required in some state and local jurisdictions, and by the Coast Guard Auxiliary for their courtesy examination decal, a paddle or pair of oars should be on all outboard boats. They could be the only way of reaching safety in the event of a motor failure. Most outboard craft row or paddle quite clumsily and with considerable effort, but it can be done, and the means to do so should be on board. Therefore, all boats will be required to carry a paddle or oars.

- Anchor and Line

  Every outboard should be equipped with a suitable anchor and line adequate in length for anchoring in all areas in which the boat is used.

- Bailer

  Every outboard should be equipped with a manual bailer. This can be a scoop purchased or homemade from a household plastic jug. A large sponge is frequently convenient for getting that last little bit of water out of a small boat.

Safety in Loading

Overloading is probably the greatest cause of accidents in small boats. Boats under 20 feet in length manufactured after October 31, 1972 must carry a capacity plate specified by Coast Guard regulations. Plates on outboard craft show boat fuel, gear and persons. Capacities from plates or self-determination are based on good weather conditions and should be reduced in rough waters.

It must always be remembered that people represent a "live" load; they move about and affect a boat quite differently than a "dead" or static load, such as the engine or fuel tank. If the capacity of the boat is fully utilized or the weather is rough, distribute the load evenly, keep it low, and don't make abrupt changes in its distribution. Any shifting of passengers or other weights should be done only after stopping or slowing the boat so that the change can be made safely.

Never jump into a boat or step on the gunwale (edge of the hull). If you have a motor or other gear to take aboard, pile it on the pier so that you can easily reach it from the center of the boat.

Handling

Before getting underway, have all weight evenly distributed so that the boat will trim properly-level from side to side and slightly down at the stern, never down at the bow. Passengers should be seated toward the centerline of the craft and not hanging over the sides; do not load too many passengers forward or aft. If the load is concentrated near the bow or stern, the boat will plow or drag needlessly, reducing your safety margin and increasing your fuel consumption. Proper trim is essential for proper performance.

Trim your boat as well as possible before getting underway. In smaller craft, it is dangerous for passengers to attempt to change places or move about while the boat is moving briskly. If such movement becomes essential, slow or stop the boat first, remembering in rough weather to keep enough momentum to retain steerage control and to keep the craft headed into wind and waves. Have the person who must move keep low and near the boat's centerline.

Outboard craft are often operated at relatively high speeds and their stability becomes a matter of safety. Some hulls will run straight ahead quite steadily, but have a tendency to heel excessively, or even "flip over", when turned sharply.

The faster a boat goes, the less keel it requires, and the more important it is to reduce speed to a safe value before starting a turn. Never turn more sharply than necessary. Normal operation seldom requires a sudden, sharp, high-speed turn.

Most outboard motors have a reverse gear than enables the boat to be operated backwards. (Very small motors usually do not have such gears, but can be pivoted around 180° to give thrust in the opposite direction.) Unless restrained, an outboard motor has the tendency to tilt itself up and out of the water when the thrust is reversed. On many models, there is a manually operated reverse lock that must be latched into place to keep the motor down while engaged in backing maneuvers. For normal running, however, it is important that this latch be released so that the lower unit will be free to tilt up if it strikes an underwater obstruction.

Courteous Operation

Keep your boat's speed under control at all times. Respect the rights and comforts of others afloat. Slow down not only when your craft is in danger, but also when it is a matter of courtesy to others. When passing other craft going in the same or opposite direction, give them a wide berth if possible, or drop down to a slow speed. When passing through or by an anchorage, throttle down to your slowest speed and keep an alert lookout for mooring, swimmers, debris, etc.

It is courteous to keep your wake low to avoid damage to other's boats. It is a wise action, too, for you are legally responsible for any damage to other boats or persons from the waves you leave behind you. **Reasonable Speeds Will Be Maintained by All Crews!**

Accidents

Various studies have shown the following to be the major causes of boating accidents:

1. Overloading, overpowering, and improper trim.
2. High speed turns, especially in rough water.
3. Failure to observe and react to obstructions.
4. Bad weather boating (prior to or after setting out).
5. Standing in a moving boat.
6. Having too much weight too high in the boat, as when someone sits on the deck of a small outboard.
7. Leaks in the fuel system.

8. Boating too far offshore.

Each of these factors, and others not listed here, should be avoided. A carefully matched boat, motor, and propeller, operated in accordance with the law and with courtesy, will go a long way toward eliminating accidents and even distressing moments. But some possibility of trouble always remains; be prepared to act in an emergency.

Capsizes

Stay with the boat if it capsizes. Almost invariably, the temptation is to try to swim to shore if land is in sight, and almost always the shore is farther than it appears. Most outboard boats will remain afloat, even if filled with water; more and more boats are being designed so that they will not only float, but will do so in an upright position. A boat is a much larger and more easily seen object than a person in the water; stay with the boat.

Rescuing a Person in the Water

One of the leading causes of death in boating accidents is drowning. Many of these fatalities result from people falling overboard. As the operator of the craft, it is your responsibility to know how to rescue such a person. You should practice maneuvers necessary to accomplish this; a ring buoy or buoyant cushion can be used as the simulated victim. Practice enough so that you will be able to react instinctively and correctly; minutes saved may mean a life saved.

As soon as someone falls overboard, maneuver the boat's stern away from him. Shift into neutral immediately (kill the motor if you do not have a gearshift) and throw a buoyant cushion or lifejacket near the victim – try to get close, but don't try to hit him with it. Make sure you are well clear of the person in the water before shifting into gear again.

Circle around quickly, selecting a course that will allow you to approach the person with the boat headed into the wind or waves. Approach him slowly, taking care to come alongside and not over him. Stop the motor before attempting to get the victim aboard.

When alongside, extend a paddle or boathook or toss one end of a line. With the motor stopped, lead the person around to the stern, where the freeboard is lowest, if there is enough space at the transom for the person to get aboard without hurting them on the motor. If this is not feasible, help the victim aboard over the side as far aft as possible. In either case, the use of a boarding ladder will help. To avoid capsizing while the person is coming aboard, other passengers should shift their weight to the opposite side to maintain trim as much as possible. When helping a person aboard, hold them under the armpits and lift gently.

Weather Rules for Safe Boating

Before setting out, obtain the latest available weather forecast for the boating area. Where they can be received, the NOAA Weather Radio continuous broadcasts (VHF-FM) are the best way to keep informed of expected weather and water conditions. While afloat, keep a weather eye out for the approach of dark threatening clouds, which might indicate a squall or thunderstorm. Check radio weather broadcasts for latest forecasts and warnings. Heavy static on your AM radio may be an indication of nearby thunderstorm or electrical (lighting) activity.

If a thunderstorm catches you while afloat, remember that not only gusty winds, but, also, lightening poses a threat to safety. If caught in a thunderstorm, remember the following:

1. Stay low.
2. Keep away from metal objects that are not grounded to the boat's protection system.
3. Don't touch more than one grounded object at the same time (or you may become a shortcut for electrical surges passing through the protection system).
4. IMMEDIATELY, attempt to get yourself and the boat out of the water.